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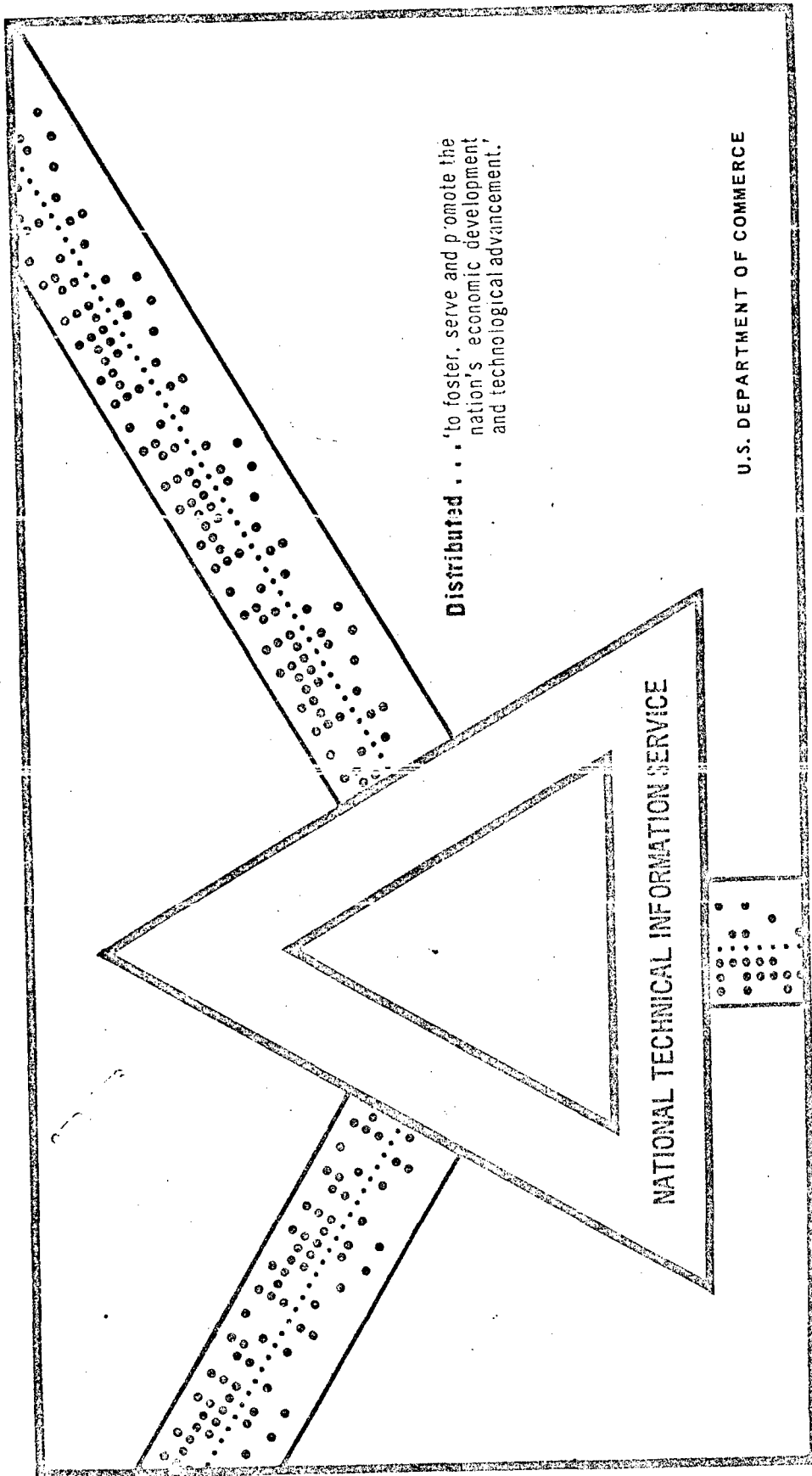
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TANK, COMBAT, FULL TRACKED

Army Test and Evaluation Command
Aberdeen Proving Ground, Maryland

28 January 1971

20020813306



28 January 1971

Material Test Procedure 3-3-090
U. S. Army Armor and Engineer Branch

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE

TANK, COMBAT, FULL TRACKED

1. OBJECTIVE

This Materiel Test Procedure (MTP) outlines procedures for determining the degree that tanks with their associated tools and equipment perform the missions described in the Qualitative Materiel Requirement (QMR) or other appropriate criteria and the suitability of the tanks and their associated maintenance test package for use by the U. S. Army.

2. BACKGROUND

Tanks, because of their great firepower, mobility, and armor protection, have played a major role in armor assault operations and exploitation behind enemy lines after a breakthrough. The large caliber main gun has a variety of ammunition which can be used for destruction of enemy armor and other hard targets and those soft targets that are not within effective range of tank-mounted machine guns. The ballistic characteristics (flat trajectory) of the main gun ammunition provides a high degree of accuracy and effectiveness against defilade targets, pillboxes and caves.

The coaxially-mounted machine gun is effective against soft targets (personnel, trucks, wooden structures, etc.) at close range and provides suppressive fire while the tank is moving. A larger caliber automatic-type weapon at the tank commander's position provides effective fire against soft targets which are beyond the range of the coaxial machine gun and against some lightly armored vehicles. This weapon can be used independently of the main gun/coaxial machine gun.

The incorporation of a rangefinder has greatly improved the first round hitting capability of the main gun, especially at the longer ranges. The development of a stabilization system has provided a vast improvement in firing from a moving vehicle at both stationary and moving targets.

Service testing should cover operation of the test item in its designed role under as great a variety of use and environmental conditions as practicable. In order to determine the extent to which its functional performance and characteristics conform to military characteristics of the applicable QMR or other appropriate criteria, testing should be done by personnel representative of those who will actually use and maintain the item under combat conditions.

3. REQUIRED EQUIPMENT

a. Maintenance Facilities (organizational, direct support and general support).

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- b. Appropriate Cross-Country Driving Courses.
- c. Appropriate Primary (Paved Highway) and Secondary (Gravel) Road Driving Courses.
- d. Fording Course.
- e. Inland Waterway Operation Course.
- f. Recovery Vehicle
- g. Cameras, Still, Motion or Video as available with necessary Film and Video Recorder, when applicable.
- h. Meteorological Equipment as required for measuring:

- 1) Wind speed and direction.
- 2) Ambient temperature.
- 3) Relative humidity.

- i. Appropriate Range Facilities.
- j. Companion Vehicles for Comparison Purposes.
- k. Platform Scales.
- l. Stopwatches.
- m. Binoculars.
- n. Appropriate Transporter(s).
- o. Ambulance with Medical Aid Personnel and Equipment.
- p. Applicable Vehicular Kits.
- q. Equipment and Facilities as Required by Referenced Materiel Test Procedures.

4. REFERENCES

- A. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- B. MTP 10-3-501, Operator Training and Familiarization.
- C. MTP 2-3-501, Safety Hazards.
- D. MTP 2-3-500, Preoperational Inspection and Physical Characteristics.
- E. MTP 6-3-500, Physical Characteristics.
- F. MTP 6-3-501, Pre-Test Inspection for Service Test.
- G. MTP 3-3-500, Preoperational Inspection and Physical Characteristics.
- H. MTP 4-3-500, Preoperational Inspection and Physical Characteristics.
- I. MTP 2-3-516, Human Factors Engineering.
- J. MTP 2-3-514, Kit Installation and Evaluation.
- K. MTP 2-3-508, Storage.
- L. MTP 3-3-504, Close-In Fields of View and Fire.
- M. MTP 4-3-519, Compatibility with Fire Control Equipment.
- N. MTP 3-3-505, Speed and Precision of Lay.
- O. MTP 2-3-505, Road Mobility.
- P. MTP 2-3-504, Cross-Country Mobility.
- Q. MTP 2-3-513, Fuel and Oil Consumption.
- R. MTP 3-3-503, Bore-sight and Zero.
- S. MTP 3-3-512, Round-to-Round Dispersion.
- T. MTP 3-3-513, First and Subsequent Round Hitting.

- U. MTP 3-3-510, Weapons Functioning.
- V. MTP 4-3-522, Combat Vehicle Ammunition Functioning.
- W. MTP 3-3-516, Obscuration.
- X. MTP 3-3-525, Vehicular Mounted Automatic Weapons Dispersion.
- Y. MTP 4-3-517, Combat Vehicle Ammunition Storage and Transportability.
- Z. MTP 4-3-104, Projectile, Antipersonnel/Antimateriel.
- AA. MTP 2-3-512, Compatibility with Related Equipment.
- AB. MTP 2-3-511, Security (Susceptibility to Detection).
- AC. MTP 2-3-509, Fording.
- AD. FM 17-12, Tank Gunnery.
- AE. MTP 3-3-507, Tracking and Hitting Performance, Stationary Gun Mount - Moving Target.
- AF. MTP 3-3-508, Tracking and Hitting Performance, Moving Gun Mount - Stationary Target.
- AG. MTP 3-3-509, Tracking and Hitting Performance, Moving Gun Mount - Moving Target.
- AH. MTP 2-3-506, Simulated Tactical Operation.
- AI. MTP 2-3-519, Surface Transportability (Vehicles).
- AJ. MTP 7-3-515, Air Portability, Internal - Suitability of Supplies and Equipment for.
- AK. MTP 7-3-516, Air Portability, External - Suitability of Supplies and Equipment for.
- AL. MTP 2-3-520, Logistics Over-the-Shore (LOTS).
- AM. MTP 2-3-502, Maintainability.
- AN. MTP 2-3-527, Maintenance Evaluation - Tools and Test Equipment.
- AO. MTP 2-3-528, Maintenance Evaluation - Technical Manuscripts and Manuals.
- AP. MTP 2-3-507, Reliability.

5. SCOPE

5.1 SUMMARY

This MTP describes procedures to be used in evaluating Tanks, Combat, Full Tracked with conventional artillery-type main armament as follows:

- a. Preparation for Test. Arrange for required facilities and review the safety release to determine the operational limitations, if any, placed on the test item due to safety hazards.
- b. Operator Training and Familiarization. Procedures for conducting the necessary training and familiarizing personnel with the test item and recording related data.
- c. Safety Hazards. A determination of the inherent safety hazards and a continuous evaluation of safety aspects of the test item

throughout the service test to support the safety confirmation (safe for intended use) statement required in service test reports.

d. Preoperational Inspection and Physical Characteristics. Pretest inspection, service and repair of the test item as required to ensure that it is in proper condition for test operation, and to determine whether physical characteristics meet specified requirements.

e. Human Factors Engineering. An evaluation to determine the human factors engineering aspects of the test item and its compatibility with the skills and aptitudes of personnel who will operate and service it.

f. Kit Installation and Evaluation:

- 1) Procedures for inspecting, unpackaging, inventorying, installing and removing kits and evaluating instructions for these tasks.
- 2) A test to determine whether accessory kits are compatible with the parent vehicle and/or other kits, functionally suitable, maintainable and reliable.

g. Stowage. A test to determine whether required items can be readily stowed and properly secured and protected throughout test operations.

h. Communications Equipment. A test to determine whether radios and their related components are physically and electrically compatible with the test vehicle and the maximum reliable range of communication under various weather conditions and types of terrain.

i. Close-In Fields of View and Fire. A test to determine the minimum distance from the vehicle that the earth surface can be seen and brought under fire by one or more of the vehicular-mounted weapons and the maximum elevation of each weapon.

j. Compatibility with Fire Control Equipment. A test to determine the suitability of fire control equipment for use with conventional ammunition - direct fire weapon combinations.

k. Speed and Precision of Lay. A test to determine the time required to accurately lay the weapon sight(s) on a clearly defined target under various conditions and modes of operation.

l. Road Mobility. A test to determine the capability of the test item to move over paved highways and gravel roads alone, and in convoy under varying weather conditions with other vehicles with which it will be associated.

m. Cross-Country Mobility. A test to determine the capability of the test item to move over various types of cross-country terrain under varying weather and soil conditions alone and in convoy with associated vehicles.

n. Fuel and Oil Consumption. A test to determine the cruising range of the test item, fuel and oil consumption and compatibility with refueling equipment.

o. Boresight and Zero. A test to determine:

- 1) Whether the test weapon and associated fire control equipment can be aligned on a common aiming point at the prescribed ranges.
- 2) Whether there is sufficient movement of the sights or mount to permit zeroing the system with sufficient reserve movement left to accommodate normal production tolerances.
- 3) The degree to which boresight alignment can be maintained under varying climatic and operating conditions.

p. Round-to-Round Dispersion. A test to determine the dispersion characteristics and hitting probability of the main armament and the applicable types of ammunition provided.

q. Gun and Turret Control System Stability - Throwoff. A test to determine the angular change in alignment of the gun and turret, either vertically or horizontally or both, resulting from the firing of a round of main armament ammunition.

r. First and Subsequent Round Hitting. A test to determine the hitting capability of the main armament weapon/fire control system and applicable types of ammunition at unknown ranges and with varying amounts of target throwoff.

s. Weapon Functioning. Procedures for collecting and recording data relative to the malfunctioning of all vehicular weapons.

t. Ammunition Functioning. Procedures for collecting and recording data relative to the as-received condition and the malfunctioning of all types of ammunition.

u. Obscuration. Procedures for determining the degree (and time) that targets are obscured from the gunner's/crew's view by smoke, muzzle flash, dust, and flash created by firing the weapons.

v. Automatic Weapons Dispersion. A test to determine the dispersion characteristics and hitting capability of each type automatic weapon system.

w. Ammunition Stowage and Transportability. A test to determine whether:

- 1) Each component of ammunition can be stowed and properly secured.
- 2) Stowage facilities:

- a) Are durable enough to withstand cross-country operation.
- b) Provide adequate protection for the stored items.
- 3) Being transported in on-vehicle storage racks has any effect on the functioning and accuracy of all ammunition types.

x. Fragment Dispersion. A test to determine the fragment dispersion characteristics of applicable test ammunition at close-in and extended ranges firing directly into the target mass and also using airburst techniques.

y. Graze Functioning. A test to determine whether an effective airburst, after ricochet, can be obtained with main armament rounds with a super-quick delayed-action fuze.

z. Antiaircraft Firing. A test to determine the capability of the ammunition-weapon-fire control combination to track and successfully engage aerial-type targets.

aa. Compatibility with Related Equipment. A series of tests to determine:

- 1) The compatibility of the test item with applicable wreckers/recovery vehicles, transporters and emergency starting facilities.
- 2) Whether the test item can tow and be towed by similar weight vehicles with which it will be associated.
- 3) The self-recovery capability of the test item.

ab. Security (Susceptibility to Detection). A test to determine the susceptibility of the test item to detection by visual, aural and infrared techniques.

ac. Fording. A test to determine the shallow, deep and under-water fording capabilities of the test item.

ad. Target Designation and Screening. A test to determine the effectiveness of the main armament white phosphorous (WP) round for:

- 1) Designating point targets.
- 2) Screening (blinding) enemy forces under various weather conditions.

ae. Tracking and Hitting Performance, Stationary Gun Mount-Moving Target. A test to determine the effectiveness of the test ammunition-weapon-fire control combination under these conditions.

af. Tracking and Hitting Performance, Moving Gun Mount-Stationary

Target. A test to determine the effectiveness of the test ammunition-weapon-fire control combination under these conditions.

ag. Tracking and Hitting Performance, Moving Gun Mount-Moving Target. A test to determine the effectiveness of the test ammunition-weapon-fire control combination under these conditions.

ah. Grenade Launcher Performance. A test to determine the effectiveness of the system in:

- 1) Screening the parent vehicle.
- 2) Providing close-in protection against human wave-type attacks.

ai. Simulated Tactical Operation. A test to determine whether typical personnel can use the test item to satisfactorily perform simulated tactical operations.

aj. Transportability. A series of tests and/or studies to determine the ease with which the test item can be prepared for transport and whether it can withstand the shocks, vibration and other extraneous forces and impacts encountered while being transported in the following modes:

- 1) By rail and ship.
- 2) By aircraft.
 - a) Internally.
 - b) Externally.

ak. Logistics Over-the-Shore (LOTS). A test to determine whether the test item can be off-loaded from a ship and moved through the surf to the shore.

al. Maintenance Evaluation.

- 1) Maintainability. A determination of the maintenance requirements, both scheduled and unscheduled, of the test item, and the ease of performing the required maintenance action.
- 2) Tools and Test Equipment. An evaluation to determine whether common and special tools and test equipment furnished for the test item are suitable for the intended purpose and maintenance level.
- 3) Technical Manuscripts and Manuals. An evaluation to determine the adequacy of technical publications provided.

am. Reliability. An evaluation of the test item's reliability to include information regarding expected service life.

LIMITATIONS

This procedure is limited to the testing of tanks equipped with conventional-type artillery guns as the main armament. The testing of tanks with gun-launcher type weapons as the main armament is covered in MTP 3-3-115, Gun Launcher Combat Vehicle Mounted.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Personnel

Ensure that test personnel are properly licensed to operate the test item.

6.1.2 Equipment and Facilities

Ensure that all equipment and facilities listed in paragraph 3 and those listed in Materiel Test Procedures referenced in paragraph 4 are available.

6.1.3 Safety Release

The project officer shall ensure that a safety release (ref 4.A), which includes information pertaining to operational limitations and specific hazards peculiar to the test item, has been received from Hq USATECOM, is understood, and compiled with during testing.

6.2 TEST CONDUCT

NOTE: The subtests listed below are those that would be applicable to the testing of the vehicle, weapons, ammunition and fire control system with all related components. The test to actually be used for any one specific project will depend upon the requirements and criteria contained in the test directive or other related documents.

6.2.1 Operator Training and Familiarization

Conduct tests as described in MTP 10-3-501 (ref 4.B).

6.2.2 Safety Hazards

Conduct a continuing evaluation of safety aspects as described in MTP 2-3-501 (ref 4.C).

6.2.3 Preoperational Inspection and Physical Characteristics

a. Perform inspections, checks, inventories, measurements, weighing, and photographing of:

- 1) The test of vehicles and fire control equipment as described in MTP 2-3-500 (ref 4.D).
- 2) Radios and related items as described in MTP 6-3-500 (ref 4.E) and MTP 6-3-501 (ref 4.F).
- 3) Weapons as described in MTP 3-3-500 (ref 4.C).
- 4) Ammunition as described in MTP 4-3-500 (ref 4.H).

b. Perform break-in operations of test item and related vehicular equipment as described in MTP 2-3-500 (ref 4.D).

6.2.4 Human Factors Engineering

Determine the effectiveness of the man-machine relationship during use of the test item as described in MTP 2-3-516 (ref 4.I).

6.2.5 Kit Installation and Evaluation

Inspect and install kits, when applicable, and conduct tests as described in MTP 2-3-514 (ref 4.J).

6.2.6 Stowage

Conduct appropriate portions of tests as described in MTP 2-3-508 (ref 4.K).

6.2.7 Communication Equipment

NOTE: Radios and related equipment used in tanks are actually kits; however, the Kit Installation and Evaluation subtest, paragraph 6.2.5 (MTP 2-3-514), primarily covers hardware-type kits rather than radios. Therefore, although the Kit Installation and Removal and perhaps some other sections of MTP 2-3-514 are usable for radio kits, this separate subtest on Communication Equipment is considered to be necessary.

6.2.7.1 Objective

The objectives of this subtest are to determine:

- a. The physical and electrical compatibility of each item of communication equipment with the vehicular electrical power system and with other electrical or electronic devices integral with the test vehicle and pertinent communication components of the combat vehicle crewman's helmet.

NOTE: This includes the vehicle intercommunication system, external telephone, and all the different combinations of receiver(s) and transmitter(s) required, beginning with the subunit of the platoon, i.e., the section, and extending through the brigade level.

b. The maximum reliable communication range on land and while fording or swimming, if applicable.

c. The mutual interference distance, if any, between:

- 1) Two radios of the same type or other types authorized for use in the tactical unit being considered.
- 2) Any of the radios authorized for installation in the test vehicles and other electronic equipment in the test or adjacent vehicles.

NOTE: Short distance radio transmission and all ultra-high frequency transmission takes place by means of direct-(space)-wave and ground-wave propagation. Tactical net-type radio sets and multichannel radio-relay type sets normally operate in these modes, in what is commonly termed the radio line of sight region. Propagation in this region is effected in several ways by intervening terrain features, earth conditions, and meteorological conditions in the lower atmosphere.

d. The suitability of the intercommunication equipment and external telephone system.

6.2.7.2 Preparation for Test

a. The QMR should be reviewed to determine the type of organizations that will use the test vehicle when and if it is adopted by the Army. The Table of Organization and Equipment (TOE) of each of these organizations should then be reviewed to determine the different types and number of radios that are to be used in the test vehicle by the various organizations. Upon completion of these determinations, appropriate USCONARC branch schools and other organizations not related to the schools, if any, should be contacted to:

- 1) Verify the correctness of data in each TOE reviewed or
- 2) Obtain up-to-date data on the number and types of radios to be installed in the test item.

b. Obtain the required radio kits in sufficient quantities to ensure a thorough test under varying terrain and weather conditions.

c. Perform the following as described in MTP 2-3-514, to the extent applicable:

- 1) Arrival inspection.
- 2) Pre-installation inspection.
- 3) Kit installation.

d. Instruct test personnel on methods of operating the radio(s) with special emphasis on precautions to prevent damaging the equipment, especially during starting of the vehicle engine by the various modes provided or authorized.

6.2.7.3 Method

a. All intercommunication equipment radio receivers and transmitters and the external telephone should be checked for proper functioning during each daily preoperational inspection.

b. All communication equipment will be turned ON at all times the vehicular master switch is ON and the vehicle is undergoing test operation and/or firing, except when otherwise directed by operating instructions.

c. Radio transmitters should be used to the extent specified in appropriate documents or if not specified:

- 1) At least for one 2-minute continuous period during each four hours of vehicle operation.
- 2) At least four 30-minute continuous periods, spaced evenly throughout the period of service testing.

d. Each intercommunication station will be used (transmitting and receiving) as required, but at least once during test operations and/or firing.

e. The external telephone system will be used (transmitting and receiving) at each maintenance halt occurring on a motor march and as needed for tactical operations. If the system has a radio transmitting and receiving capability, these will also be utilized at one of the maintenance halts during each eight hours of vehicle operation.

NOTE: Maintenance halt is a predesignated and specified period of time during a march (e.g., usually 15 or 20 minutes every even hour) when vehicles are halted and troops perform maintenance.

f. With all on-equipment materiel (OEM) for the test vehicle and the appropriate TOE and TA items stowed or mounted as applicable, and with a full complement of personnel, the test vehicle will be operated as described in other applicable subtests of this MTP. The following will be noted throughout all test operations:

- 1) Incompatibility of the communication equipment, if any, with other items in the test vehicle.
- 2) Any mutual interference problems.
- 3) Suitability with respect to safety and compatibility with the skills, aptitudes and limitations of personnel who will operate and service the:

- a) Test vehicle.
- b) Communication equipment.
- 4) Interference of communication equipment, if any, with the performance of other required tasks in the test vehicle.
- 5) The critical distance (closeness) at which performance of communication equipment in one tank is adversely affected by operation of electrical components in an adjacent tank.

8. The test and companion vehicles with each different combination of radio receiver(s) and transmitter(s) in operation will be operated over various types of terrain or used, as applicable, to determine the maximum reliable range during daylight under the following conditions:

NOTE: The maximum reliable communication range is the range at which communications can be established and maintained 95 percent of the time. All testing should begin at a range where 100 percent is easily obtainable and then increased gradually until the maximum range is established.

- 1) Two vehicles stationary.
- 2) One vehicle moving and the other stationary.

NOTE: The maximum reliable range will be determined in all directions about the stationary vehicle.

- 3) Two moving vehicles.

h. Repeat procedures described in paragraph g above:

- 1) At night.
- 2) Under as many different weather and terrain conditions as practicable to include vehicles operating cross-country and on various types of roads.

i. Determine the maximum reliable communication range with:

- 1) Test vehicle stationary and a companion vehicle operating under the following conditions, as applicable:
 - a) Shallow fording.
 - b) Deep fording.
 - c) Underwater fording.
 - d) Swimming.

- 2) Repeat procedures described in paragraph i) above with the test vehicle moving over as many different types of terrain as practicable.

- 3) Repeat procedures described in paragraph 1) with the test vehicle performing those water operations applicable to its design capability or provided by kits.

j. The combat vehicle crewman's helmet should be worn during all test operations and its compatibility with on-vehicle communication equipment determined, especially the communication cable in the following areas:

- 1) Ease of connecting and disconnecting.
- 2) Length of cable, i.e., is it long enough to permit accomplishing all tasks within the vehicle.
- 3) Does it interfere with the accomplishment of any task within the vehicle.

NOTE: See MTP 10-3-206, Helmets, Combat Vehicle Crewmans, for detailed procedures on testing the helmet and its integral communication equipment.

k. Determine the maximum reliable communication range of the external telephone operating in the radio mode, if applicable, under the following conditions:

- 1) Two vehicles stationary.
- 2) The transmitting vehicle stationary and the receiving vehicle moving at varying speeds.
- 3) Two vehicles moving at a fast walking pace.

l. With all electronic equipment in the position indicated in the operator's manual or other appropriate document, the test vehicle engine will be started by the following modes:

- 1) Slaving.
- 2) Towing.

m. Repeat procedures described in paragraph 1 above near the beginning, midway point and end of the service test.

6.2.8 Close-In Fields of View and Fire

Conduct tests as described in MTP 3-3-504 (ref 4.L).

6.2.9 Compatibility with Fire Control Equipment

Conduct tests as described in MTP 4-3-519 (ref 4.M).

6.2.10 Speed and Precision of Lay

Conduct tests as described in MTP 3-3-505 (ref 4.N).

6.2.11 Road Mobility

Conduct road mobility testing as described in MTP 2-3-503 (ref 4.0) and below unless otherwise specified in the test directive or other approved document.

a. During the initial paved and gravel road convoy operations with associated vehicles and other special tests such as maximum and minimum speeds, acceleration and braking tests, all test vehicles, comparison vehicles, and associated items, with trailed load as applicable, should carry maximum rated or full combat loads.

b. As a minimum special tests should be conducted near the beginning, midway point and end of testing.

6.2.12 Cross-Country Mobility

Conduct cross-country mobility testing as described in MTP 2-3-504 (ref 4.P) and below unless otherwise specified in the test directive or other approved document.

a. During the initial cross-country operations with associated vehicles and other special tests such as maximum grade, side slope, obstacle crossing, etc., all test and comparison vehicles and associated items, with trailed load when applicable, should carry maximum rated or full combat loads.

b. As a minimum, these special tests should be conducted near the beginning, midway point and end of test.

6.2.13 Fuel and Oil Consumption

Conduct cruising range and refueling tests and maintain records of all fuel and oil consumed as described in MTP 2-3-513 (ref 4.Q).

6.2.14 Boresight and Zero

Conduct tests as described in MTP 3-3-503 (ref 4.R).

NOTE: A complete list of tests for antipersonnel/antimateriel, and armor defeating rounds for the main armament, and various types of ammunition for vehicular-mounted automatic weapons are shown in Figures 1, 2, and 3 respectively.

6.2.15 Round-to-Round Dispersion

Conduct tests as described in MTP 3-3-512 (ref 4.S).

Tests	Ammunition Type*					
	1	2	3	4	5	6
Boresight and Zero					X	
Fragment Dispersion - Phase I	X	X				
Phase II	X	X			X	
Phase III	X	X	X			
Ammunition Functioning	X	X	X	X	X	X
Weapons Functioning	X	X	X	X	X	X
Obscuration	X	X	X	X	X	X
Round-to-Round Dispersion		X	X	X	X	X
Graze Functioning			X			X
First and Subsequent Round Hitting		X	X	X	X	X
Tracking & Hitting Perf, Stationary **		X	X	X	X	X
Gun Mount-Moving Target						
Tracking & Hitting Perf, Moving Gun **		X	X	X	X	X
Mount-Stationary Target						
Tracking and Hitting Perf, Moving **		X	X	X	X	X
Gun Mount-Moving Target						
Antiaircraft Firing		X				

- *1. Canister (Any APERS projectile that does not incorporate a fuze)
2. APERS (Any APERS that incorporates a fuze)
3. HE
4. HEP
5. HEAT-MP
6. WP

NOTE: Training practice rounds will be subjected to the same tests as their combat counterpart.

**Matching TP-T ammunition will be substituted where necessary to preclude damage to range facilities.

Figure 1. Tests for Antipersonnel/Antimateriel Main Armament Ammunition.

Firing Tests	Ammunition Type*				
	1	2	3	4	5
Boresight and Zero	X	X		X	X
Ammunition Functioning	X	X	X	X	X
Weapon Functioning	X	X	X	X	X
Obscuration	X	X	X	X	X
Round-to-Round Dispersion	X	X	X	X	X
First and Subsequent Round Hitting	X	X	X	X	X
Tracking & Hitting Perf, Stationary ** Gun Mount-Moving Target	X	X	X	X	X
Tracking & Hitting Perf, Moving Gun ** Mount-Stationary Target	X	X	X	X	X
Tracking & Hitting Perf, Moving Gun Mount-Moving Target	X	X	X	X	X

- *1. AP
2. APFSDS
3. HEP
4. HEAT
5. HEAT-MP

NOTE: 1. Training practice rounds will be subjected to the same tests as their combat counterpart.

2. The round used for zeroing will be the primary armor defeating round unless otherwise specified.

**Matching TP-T ammunition will be substituted where necessary to preclude damage to range facilities.

Figure 2. Tests for Armor Defeating Main Armament Rounds.

Tests	Ammunition Type*					
	1a	1b	1c	2	3a	3b
Boresight and Zero	X			X	X	
Ammunition Functioning	X	X	X	X	X	X
Weapon Functioning	X	X	X	X	X	X
Obscuration	X	X	X	X	X	X
Automatic Weapons Dispersion	X	X	X	X	X	X
Tracking & Hitting Perf, Stationary Gun Mount-Moving Target	X	X	X	X	X	X
Tracking & Hitting Perf, Moving Gun Mount-Stationary Target	X	X	X	X	X	X
Tracking & Hitting Perf, Moving Gun Mount-Moving Target	X	X	X	X	X	X
Antiaircraft Firing				X	X	X

- *1. Caliber .30/7.62 Millimeter Machine Guns

- a. Armor-Piercing (AP)/Ball
b. Armor-Piercing Incendiary (API)
c. Tracer

2. Caliber .50 Machine Gun(s)
Armor-Piercing Incendiary (API) Armor Piercing Incendiary
Tracer (API-T)/Ball

3. 20 Millimeter and above

- a. Armor-Piercing Incendiary Tracer (API-T)
b. High Explosive Incendiary Tracer (HEI-T)
c. High Explosive Practice with Tracer (HE/P-T)

NOTE: Training practice rounds will be subjected to the same tests as their combat counterpart.

Figure 3. Tests for Automatic Weapon Ammunitions.

6.2.16 Gun and Turret Control System Stability-Throwoff

NOTE: Throwoff is defined as the angular change in alignment of the gun and turret, either vertically or horizontally or both, which results from the firing of a round of main armament ammunition. It is a measure of gun and turret control system stability (considering both power and manual modes). It is also in part a measure of the recovery characteristics of the vehicular suspension system. The overall effect is reflected in the return of the sight to or near its original lay with respect to the point of aim. Minimal throwoff combined with positive damping of vehicular motion is critical to successful use of burst-on-target fire adjustment techniques in the First and Subsequent Round Hitting subtest.

6.2.16.1 Preparation for Test

- a. The range facilities will be the same as for the Boresight and Zero, and Round-to-Round Dispersion subtests.
- b. The targets used for the Boresight and Zero, and Round-to-Round Dispersion subtests may be used as an economy measure, if desired, but more accurate measurements can be obtained by using a target as shown in Appendix A.

6.2.16.2 Test Objective

To establish the stability characteristics of the main gun and turret control system in terms of resistance to throwoff in alignment as the result of firing.

6.2.16.3 Test Conduct

6.2.16.3.1 Single Round Determination. This will be accomplished during the Boresight and Zeroing, and/or Round-to-Round Dispersion firing with each appropriate type of ammunition.

- a. With the suspension system locked and the gun/turret control system in the following modes, as applicable, record throwoff data for three rounds of each type of ammunition:

- 1) Manual.
- 2) Power (unstabilized).
- 3) Power (stabilized).

- b. Both the primary and secondary sight will be precisely aligned on the aiming cross before each round is fired.

- c. After firing each round measure the amount of throwoff as shown by the:

- 1) Primary sight.
- 2) Secondary sight.

- d. Repeat procedures described in paragraphs a, b and c above except that the suspension system will not be locked.

- e. Compare the throwoff with the suspension system locked and unlocked.

6.2.16.3.2 Multi-Round Determination. Upon completion of the Boresight and Zeroing subtest:

- a. Lock the suspension system (set the parking brakes) and:

- 1) Relay the primary and secondary sight precisely on the aiming cross of the zeroing target.
- 2) Fire three rounds of the ammunition type used for zeroing without relaying the sights.
- 3) Measure the:

- a) Throwoff of the:

1. Primary sight.
2. Secondary sight.

- b) Distance of each projectile strike from the point of aim.

- 4) Compute the center of impact and standard deviation of the 3-round group as described in MTP 3-3-512 (ref 4.S).

- b. Repeat procedures described in paragraph a above except that the suspension system will not be locked.

- c. Compare the amount of throwoff with the suspension system locked and unlocked.

6.2.17 First and Subsequent Round Hitting

Conduct tests as described in MTP 3-3-513 (ref 4.T).

6.2.18 Weapon Functioning

Conduct tests as described in MTP 3-3-510 (ref 4.U).

6.2.19 Ammunition Functioning

Conduct tests as described in MTP 4-3-522 (ref 4.V).

6.2.20 Obscuration

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Conduct tests as described in MRP 3-3-516 (ref 4.W).

6.2.21 Automatic Weapons Dispersion

Conduct tests as described in MTP 3-3-525 (ref 4.X).

6.2.22 Ammunition Storage and Transportability

Conduct tests as described in MTP 4-3-517 (ref 4.Y).

6.2.23 Fragment Dispersion

Conduct phase(s) of testing as described in MTP 4-3-104 (ref 4.Z) that are applicable to the design of the antipersonnel (APERS) or canister round being tested.

6.2.24 Graze Functioning

Conduct tests as described in MTP 4-3-104 (ref 4.Z) when applicable.

6.2.25 Antiaircraft Firing

Conduct tests as described in MTP 4-3-104 (ref 4.Z), when appropriate.

6.2.26 Compatibility with Related Equipment

Conduct tests as described in MTP 2-3-512 (ref 4.AA).

6.2.27 Security (Susceptibility to Detection)

Conduct tests as described in MTP 2-3-511 (ref 4.AB).

6.2.28 Fording

Conduct applicable parts of tests as described in MTP 2-3-509 (ref 4.AC).

6.2.29 Target Designation and Screening

This subtest is divided into two phases.

a. Phase I covers the designation of targets for friendly ground or air support weapons.

b. Phase II covers the screening or blinding of enemy forces.

6.2.29.1 Objectives

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To determine the suitability of the white phosphorous (WP) round for:

a. Designating point targets up to the maximum effective anti-tank range of the weapon system.

b. Screening (blinding) enemy forces up to the maximum effective antitank range of the weapon system.

NOTE: This is a multi-purpose round employed for screening, incendiary, casualty producing, and target marking purposes. Therefore, it will be tested in conjunction with other antipersonnel/antimateriel rounds as well as the armor defeating rounds. The basic tests for the WP round, other than in the screening and target marking roles, are shown in Figure 1 along with those for all other main armament type rounds used in the antipersonnel/antimateriel roles.

6.2.29.2 Phase I - Target Designation. This test should be conducted in conjunction with the unknown range firing such as in the First and Subsequent Round Hitting or Simulated Tactical Operations subtests as follows:

a. The project officer should select a target in the medium or long range bracket and designate it to the commander of the tank which will fire the WP round(s).

1) The tank commander should issue the necessary elements of the fire command as described in FM 17-12 (ref 4.AD). Then he will either determine the range to the target or have it determined as dictated by the design of the fire control system.

2) The tank commander will decide where the weapon sights will be laid in relation to the target and either make the lay or have the gunner do so.

NOTE: The direction and velocity of the wind must be considered in deciding where to place the marker projectile to ensure that the target will not be obscured.

3) Fire the marker round and relay the range data and target description to the supporting vehicle(s).

4) Adjacent (supporting) vehicle(s) will fire on the marked target using the range data relayed by the commander of the vehicle that fired the marker round.

NOTE: In an emergency targets can be marked with WP for aerial support missions; however, normally this should be done by the Artillery as they have colored smoke rounds (red green, and yellow) that are much easier to see.

- 5) If the supporting vehicle(s) do not obtain a first round hit, continue firing, using the burst-on-target method of adjustment, until the target is hit.

b. Photograph the smoke from the marker projectile immediately after detonation and as required to show the drift of the smoke.

- c. Record data as described in paragraph 6.3.29.1.

6.2.29.3 Phase II - Target Screening

NOTE: The purpose of screening is to blind the enemy, allowing greater freedom of movement of friendly forces. It may be placed in front of the enemy to screen the maneuver of attacking forces or to cover their withdrawal. Due to the limited number of WP rounds in the basic ammunition load for tanks and the tendency of WP smoke to dissipate and rise rapidly, it should be used for screening purposes only when other sources are not available. Screening has always been considered as primarily an Artillery role.

6.2.29.3.1 Preparation for Test. Preparation for testing as follows:

- a. Select a target site area which can be fired on from varying distances up to the maximum effective antitank range of the weapon system.

- b. Erect a target formation representative of an enemy combat unit with various size targets to represent:

- 1) Combat vehicles.
- 2) Cargo vehicles.
- 3) Crew-served weapons
- 4) Personnel.

- c. Position the following near the line of fire and on either side of the firing vehicle(s):

- 1) Photographers with movie or video and still cameras
- 2) Observers, each with a stopwatch and one-half of them with binoculars.

6.2.29.3.2 Method. Conduct the test as follows:

- a. Determine the range to the target formation and the point at which the screening projectile(s) should impact in relation to the target formation. The basic factors governing the employment of smoke are wind direction and velocity.

- 1) With a wind from the flank, the screen is started upwind of the target so that it will drift into and in front of the target formation.

- 2) With a tailwind, the smoke should be placed just in front of the target.
- 3) With a headwind, smoke should be placed on or behind the target.

NOTE: 1. When the wind velocity is high, the rate of fire must be increased to maintain the screen.

2. When firing into a strong headwind, consideration must be given to smoke drifting over friendly positions.

b. Fire initial round and:

- 1) Adjust fire control setting or aiming point, if required, and fire succeeding round(s) until projectile impact is at desired point.
- 2) Fire additional rounds on a continuing basis and make adjustments, if required, to keep the target formation screened for:

- a) Three minutes.
- b) Five minutes.
- c) Ten minutes.

- c. Photograph the smoke screen throughout each period, if practicable.

d. Observers should:

- 1) Measure the time required to entirely mask the enemy target formation.
- 2) Record the time that any part of the enemy target formation becomes visible and:

- a) Note the clarity of the target(s)
- b) Record the amount of time the target(s) could be seen.

- 3) Prepare a written summary of the overall effectiveness of the screening operation as seen from their respective positions and indicate whether they were using binoculars.

e. Record data as described in paragraph 6.3.29.2.

6.2.30 Tracking and Hitting Performance, Stationary Gun Mount-Moving Target

Conduct tests as described in MTP 3-3-107 (ref 4.AF).

6.2.31 Tracking and Hitting Performance, Moving Gun Mount-Stationary Target

Conduct tests as described in MTP 3-3-108 (ref 4.AF).

6.2.32 Tracking and Hitting Performance, Moving Gun Mount-Moving Target

Conduct tests as described in MTP 3-3-509 (ref 4.AG).

6.2.33 Grenade Launcher Performance

6.2.33.1 Objective

a. To determine the suitability of the grenade launcher and grenades in the:

- 1) Screening role.
- 2) Antipersonnel role.

b. To determine whether:

- 1) Grenades can be stowed and properly secured.
- 2) Storage facilities.

a) Are durable enough to withstand cross-country operation.

b) Provide adequate protection for the stowed grenades.

3) Whether being transported cross-country in the on-vehicle storage racks and in the launchers has any effect on the functioning and performance of the grenades and/or launchers.

NOTE: This test is divided into two phases. Phase I covers the screening role and Phase II covers the antipersonnel role.

6.2.33.2 Phase I - Screening Effectiveness

NOTE: The purpose of a grenade launched screen around all or a portion of a tank is to prohibit enemy forces from aiming precisely on the vehicle. Usually this is when it is disabled and repairs are being made or it is being retrieved from enemy view by another tank or a recovery vehicle.

6.2.33.2.1 Preparation for Test. Prepare for testing as follows:

a. Select a site and position the test vehicle where it can be observed from any point in a 360 degree circle extending out from a minimum range of 160 meters to a maximum range to 500 meters unless otherwise specified.

b. Select stations at various ranges throughout the circle for:

- 1) Cameras, motion, video and still, as available.
- 2) Observers with binoculars.
- 3) Observers without binoculars.

c. Prepare a scaled plot of the test setup and number each station selected.

d. Place flags in front of each tank at the maximum specified range for the grenades and spaced an equal distance apart for use in determining the area coverage provided.

e. Arrange meteorological equipment.

6.2.33.2.2 Method. Conduct screening tests as follows:

a. Load all dispensers and proceed as follows unless otherwise directed:

- 1) Fire them one at a time in rapid succession.
- 2) Measure time required to fire all dispensers.
- 3) Photograph entire firing sequence.
- 4) Have observers:
 - a) Record their position number.
 - b) Measure time required to fire each dispenser.
 - c) Estimate range and width of smoke coverage.
 - d) Measure the time that the screen was effective.
 - e) Write a description of the smokescreen and their opinion as to its effectiveness as viewed from each particular station.

b. Prepare graph showing area covered by smokescreen.

c. Record all meteorological data as described in paragraph 6.3.34.

d. Fire dispensers as shown below to the extent possible and photograph, measure and prepare a graph form of area coverage and a written evaluation of each firing and the condition under which firing was done as described in paragraphs a, b, and c above:

- 1) Two-round salvos using various dispenser combinations.
- 2) Four-round salvos using various dispenser combinations.
- 3) All-round simultaneously.
- 4) Other salvos, if specified in test directive or other appropriate document.

e. Based upon the experience gained in the firing described in paragraph a through d above, calculate the number of rounds and most efficient method of firing to mask the test vehicle across a 120 degree front

and keep it masked for periods of up to 10 minutes and:

- 1) Position observers and photographer at appropriate stations (paragraph b above).
- 2) Fire initial salvo or series of rounds as calculated.
- 3) Photograph the entire operation to the extent practicable.
- 4) Have observers:

a) Measure the time:

1. Required to completely mask the test vehicle as seen from their respective positions.
2. From complete masking of vehicle until any part of the vehicle becomes visible.

b) Call for additional rounds or salvos as required to keep the vehicle completely masked for:

1. Three minutes.
2. Five minutes.
3. Eight minutes.
4. Ten minutes.

f. Stow grenades in on-vehicle stowage racks and load grenades in all launchers and operate the vehicle cross-country as described in MTP 4-3-517 (ref 4.Y) for other types of ammunition.

g. Repeat the exercise described in paragraph e above except that the mask will be across a 180 degree front.

h. Repeat exercises described in paragraph e and g above:

- 1) Under as many different meteorological conditions as possible, especially as related to heat, moisture and wind.
- 2) Near the beginning, midway point and end of service testing.
- 3) Using grenades transported for varying distance in the on-vehicle stowage racks as described in MTP 4-3-517 (ref 4.Y) and in the grenade launchers.

i. As a minimum, conduct the firing exercises near the beginning, midway point and end of service testing.

j. Compare results obtained with grenades which had been transported for varying distances in the on-vehicle stowage racks and/or in the grenade launchers with the results obtained with rounds that were not so transported.

6.2.33.3 Phase II - Antipersonnel Effectiveness

6.2.33.3.1 Preparation for Test. Prepare for testing as follows:

a. Select a site on a firing range and position the vehicle where it can be circled with targets out to the maximum specified range of the antipersonnel grenades.

b. Erect silhouette targets at uneven intervals around the test vehicle beginning near the vehicle and extending out to the maximum specified range of the grenade(s).

NOTE: This target formation should be representative of an enemy tactical unit in a human wave attack on the test vehicle.

c. Prepare a plot of the target arrangement and number each target.

d. Prepare a diagram of the dispenser arrangement and number each dispenser.

6.2.33.3.2 Method. Conduct test as follows:

a. With the main armament facing over the front center of the vehicle:

1) Fire one dispenser and:

- a) Record the number of the dispenser fired.
- b) Count all target hits and record:

1. Total number of targets hit.

2. Number of hits on each target by target number.

c) Repair or replace targets as required.

2) Repeat the exercise described in paragraph 1) above until all dispensers have been fired.

3) Using the plot of the target arrangement (paragraph 6.2.33.3.1c above) show:

a) Each target hit.

b) Number of hits on each target.

NOTE: Adjust size of target formation, if necessary, to ensure that target area exceeds the total grenade strike area.

b. Based upon the area coverage obtained by firing described in paragraph a above calculate the number of miles the turret would need to be traversed after each firing when firing in the following modes as applicable:

- 1) Firing 2-round salvos using various dispenser combinations.
- 2) Firing 4-round salvos.
- 3) Firing all dispensers simultaneously.
- 4) Firing other salvos and combinations, if considered appropriate to obtain the quickest and most effective coverage of any selected area.

c. Using the computations arrived at in paragraph b above:

- 1) Fire single dispensers or salvos as considered necessary to cover:
 - a) An area of 120 degrees centered on the front of the vehicle.
 - b) An area of 180 degrees centered on the front of the vehicle.
 - c) An area completely surrounding the vehicle.
- 2) Count the number of targets hit and the number of hits on each target by target number after each firing exercise.
- 3) Repair or replace targets after each firing exercise, as required.

d. Stow grenades in on-vehicle storage racks and load grenades in all launchers and operate the vehicle cross-country as described in MTP 4-3-517 (ref 4.Y) for other types of ammunitions.

e. Repeat firing exercises described in paragraph a, b, and c above using grenades transported for varying distances in the on-vehicle storage racks as described in MTP 4-3-517 (ref 4.Y) and/or in the grenade launchers.

f. As a minimum, conduct the firing exercises near the beginning, midway point and end of service testing.

g. Compare results obtained with rounds which had been transported for varying distances in the on-vehicle ammunition racks and/or in the grenade launchers with the results obtained with rounds that were not so transported.

6.2.34 Simulated Tactical Operation

Conduct applicable tests as described in MTP 2-3-506 (ref 4.AH).

6.2.35 Transportability

a. Surface Transportability (Vehicles). Conduct tests as described in MTP 2-3-519 (ref 4.AI).

b. Air Portability, Internal - Suitability of Supplies and Equipment for. Conduct tests as described in MTP 7-3-515 (ref 4.AJ).

c. Air Portability, External - Suitability of Supplies and Equipment for. Conduct tests as described in MTP 7-3-516 (ref 4.AK).

6.2.36 Logistics Over-the-Shore (LOTS)

Conduct tests as described in MTP 2-3-520 (ref 4.AL).

6.2.37 Maintenance Evaluation

a. Maintainability. Conduct the maintainability evaluation and make required computations for the test item as described in MTP 2-3-502 (ref 4.AM) or other appropriate documents.

b. Tools and Test Equipment. Throughout the performance of all prescribed maintenance services and all maintenance tasks, a record of tools and test equipment used should be maintained as described in MTP 2-3-527 (ref 4.AN) to determine whether the common and special tools and test equipment are suitable for the intended purpose and prescribed level of maintenance.

c. Technical Manuscripts and Manuals. All equipment publications provided with or furnished as a guidance for use and maintenance of the test item should be continuously evaluated with respect to availability, adequacy, accuracy and currency and required changes forwarded as described in MTP 2-3-528 (ref 4.AO).

6.2.38 Reliability

Conduct reliability testing and make required computations for the test item as described in MTP 2-3-507 (ref 4.AP) or other appropriate documents.

NOTE: When applicable, test cycling should be designed to distribute operations evenly throughout the entire test and, where possible, each season of the year. Figure 1 shows an example mileage cycle for use when none is specified in the QMR or other criteria. The percentages shown in Figure 1 are percentages of the mileage breakdown. It is emphasized that the number of miles specified for each type of operation in a cycle are not to be run continuously until a full quota of a type is completed. On the contrary, in an attempt to duplicate troop use of the vehicle, every effort will be made to develop a proper proportion of each type mileage as it would be accumulated in user organizations.

a. The designation of each type organization that will be issued the test vehicle, if it is adopted.

b. The TOE number for each organization listed in paragraph a above with proposed revisions, if applicable.

c. For radio sets:

- 1) Each type of radio set (transmitter/receiver) to be installed in the test vehicle.
- 2) Each combination of transmitters and receivers.
- 3) The total number of transmitters and receivers received, by type and serial number.

d. The type of intercommunication system (cord or cordless) and number of stations in test vehicles.

e. Type of external telephone provided and whether it had a radio as well as an intercommunication capability.

f. For each type of communication equipment received:

- 1) Results of the arrival inspection as described in MTP 2-3-514 (ref 4.J).
- 2) Results of preinstallation inspection as described in MTP 2-3-514 (ref 4.J).
- 3) Kit installation data as described in MTP 2-3-514 (ref 4.J).

NOTE: Any adjustments and/or repairs made to the radio sets or their mounts and associated equipment should be recorded here and also under the Maintenance Evaluation Maintainability subtest.

g. The names, rank or grade, and military occupational specialty number (MOS) of personnel given instructions on operating the various types of radio sets and:

- 1) Amount (in hours or fraction thereof) of instruction given.
- 2) Safety or operational precautions to be observed, if any, especially as related to the position of electrical switches when starting the vehicle engine by the various means provided or authorized.

6.3.7.2 Test Conduct

Record the following for each type of communication equipment

used:

Type Vehicle	Total	Highway*	Secondary**	Cross-Country
Tank	750	210 (28%)	270 (36%)	270 (36%)

* Paved roads
** Gravel or improved dirt roads

Figure 1. Sample Mileage Cycles for Tank, Combat, Full Tracked.

6.3 TEST DATA

6.3.1 Operator Training and Familiarization

Record data for each test participant as described in MTP 10-3-501 (ref 4.B).

6.3.2 Safety Hazards

Record applicable data as described in MTP 2-3-500 (ref 4.D), MTP 6-3-500 (ref 4.E) and MTP 2-3-501 (ref 4.C).

6.3.3 Preoperational Inspection and Physical Characteristics

Record data as described in MTP 2-3-500 (ref 4.D), MTP 6-3-500 (ref 4.E), and MTP 6-3-501 (ref 4.F), MTP 3-3-500 (ref 4.G) and MTP 4-3-500 (ref 4.H). When services, adjustments and repairs are made they will be recorded here and also under the Maintenance Evaluation Maintainability subtest.

6.3.4 Human Factors Engineering

Record data as described in MTP 2-3-516 (ref 4.I).

6.3.5 Kit Installation and Evaluation

Record data as described in MTP 2-3-514 (ref 4.J).

6.3.6 Storage

Record applicable data as described in MTP 2-3-508 (ref 4.K).

6.3.7 Communication Equipment

Preparation for Test:

Record the following:

- a. Date and time.
- b. Results of each preoperational (daily) inspection to include:
 - 1) Adjustments made, if any.
 - 2) Parts repaired or replaced, if any.
 - 3) Time required to perform tasks in man-hours and clock-hours.
- c. Miles and hours the test vehicle was operated.
- d. Miles and hours the receiver was in the ON position.
- e. Total number of transmissions made and duration of each.
- f. Type of receiver and transmitter combination by designation and serial number and:
 - 1) Type organization being simulated.
 - 2) Number of personnel:
 - a) As authorized crew for the vehicle.
 - b) Actually in vehicle.
 - 3) Problems encountered, if any.
 - 4) List of prescribed OEM, TOE or TA items or acceptable substitutes, if any, not in or on vehicle.
- g. Number of times intercommunication equipment was used and total duration.
- h. Number of times and total accumulated time the external telephone was used:
 - 1) In the intercommunication mode.
 - 2) In the radio mode, if applicable.
- i. Difficulties, if any, encountered in the use of the intercommunication equipment and/or external telephone.
- j. Description of terrain traversed (paved or secondary roads or cross-country).
- k. Ambient temperature.
- l. Relative humidity.
- m. Difficulties encountered, if any, in operating any of the communication equipment and reasons therefore, if possible.

- n. Incompatibilities, if any, between communication equipment and other equipment including the integral communication components of the combat vehicle crewman's helmet.
- o. Safety hazards noted, if any.
- p. Maximum reliable radio communication range obtained during daylight and darkness with:
 - 1) Two vehicles stationary.
 - 2) One vehicle moving cross-country and on roads and the other stationary.
 - 3) Two vehicles moving on roads and cross-country and a combination of the two.
- q. Atmospheric and weather conditions under which data described in paragraph p above were obtained.
- r. The degree, if any, in which the following affected the maximum obtainable range:
 - 1) Inclement weather (describe conditions).
 - 2) Terrain features (describe).
 - 3) Vehicle noise.
- s. Maximum reliable radio communication range obtained with the test vehicle both stationary and moving and a companion vehicle:
 - 1) Shallow fording.
 - 2) Deep fording.
 - 3) Underwater fording.
 - 4) Swimming.
- t. The maximum reliable communication range obtained using the external telephone in the radio mode, if applicable, with:
 - 1) Two vehicles stationary.
 - 2) One vehicle stationary and the other moving.
- u. The degree, if any, the external telephone/radio communications were affected by:
 - 1) Inclement weather (describe conditions).
 - 2) Terrain features (describe).
 - 3) Vehicle noise.
- v. Number of times the test vehicle engine was started by:
 - 1) Slaving.
 - 2) Towing.

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v. Damage, if any, to communications equipment by starting the test vehicle engine by:

- 1) Slaving.
- 2) Towing.

x. Problems, if any, in operating the external telephone.

y. Problems, if any, in operating the external telephone in the radio mode, if applicable.

z. Difference, if any, in the maximum reliable communication obtained with the external telephone operating in the radio mode, when applicable, and the normal radio mode of operation.

6.3.8 Close-In Fields of View and Fire

Record data as described in MTP 3-3-504 (ref 4.L).

6.3.9 Compatibility with Fire Control Equipment

Record data as described in MTP 4-3-519 (ref 4.M).

6.3.10 Speed and Precision of Lay

Record data as described in MTP 3-3-505 (ref 4.N).

6.3.11 Road Mobility

Record data as described in MTP 2-3-505 (ref 4.O).

6.3.12 Cross-Country Mobility

Record data as described in MTP 2-3-504 (ref 4.P).

6.3.13 Fuel and Oil Consumption

Record data as described in MTP 2-3-513 (ref 4.Q).

6.3.14 Boresight and Zero

Record data as described in MTP 3-3-503 (ref 4.R).

6.3.15 Round-to-Round Dispersion

Record data as described in MTP 3-3-512 (ref 4.S).

6.3.16 Gun and Target Control System Throwoff

Single Round Determination

Record the following for each type of ammunition fired:

- a. Date.
- b. Gunner's name and rank or grade.
- c. Ambient temperature.
- d. Relative humidity.
- e. Wind speed and direction.
- f. For the vehicle:
 - 1) Nomenclature.
 - 2) Serial number.
 - 3) Test miles accumulated.
- g. For the main armament:
 - 1) Nomenclature.
 - 2) Serial number.
 - 3) Number of previous rounds fired by type through:
 - a) The gun.
 - b) The gun barrel.
- h. For the ammunition:
 - 1) Nomenclature.
 - 2) Lot number.
- i. Range to target, in meters or yards, and type target used.
- j. Description of target.
- k. Nomenclature and serial number of:
 - 1) Primary sight.
 - 2) Secondary sight.
- l. Whether both sights were aligned on same point before firing and, if not, the vertical and horizontal differences between the two.
- m. The amount of throwoff for each sight after each round fired.
- n. The difference, if any, in the direction of throwoff for the two sights.
- o. Whether suspension system was locked (parking brakes set).

p. Mode of control used, i.e.:

- 1) Manual.
- 2) Power, unstabilized.
- 3) Power, stabilized.
- 4) Any combination of the above, if applicable.

q. Sight used for laying weapon.

6.3.16.2 Multi-Round Determination

Record data as described in paragraph 6.3.16.1 and the following for each group of each type of ammunition fired:

- a. Number of rounds in group.
- b. Distance of each projectile strike from point of aim.
- c. Distance of center of impact (CI) from point of aim.
- d. Standard deviation (SD) for each 3-round group fired.
- e. The difference, if any, in the averages of the CI and SD recorded in subparagraphs c and d above for:
 - 1) The following modes of control, as applicable:
 - a) Manual.
 - b) Power, unstabilized.
 - c) Power, stabilized.
 - d) Any combination of the above, if applicable.
 - 2) Each sight used.

6.3.17

First and Subsequent Round Hitting

Record data as described in MTP 3-3-513 (ref 4.T).

6.3.18

Weapons Functioning

Record data as described in MTP 3-3-510 (ref 4.U).

6.3.19

Ammunition Functioning

Record data as described in MTP 4-3-522 (ref 4.V).

6.3.20

Obscuration

Record data as described in MTP 3-3-516 (ref 4.W).

6.3.21

Automatic Weapons Dispersion

Record data as described in MTP 3-3-525 (ref 4.X).

6.3.22

Ammunition Storage and Transportability

Record data as described in MTP 4-3-517 (ref 4.Y).

6.3.23

Fragment Dispersion

Record applicable data as described in MTP 4-3-104 (ref 4.Z).

6.3.24

Graze Functioning

Record data as described in MTP 4-3-104 (ref 4.Z).

6.3.25

Antiaircraft Firing

Record data as described in MTP 4-3-104 (ref 4.Z).

6.3.26

Compatibility with Related Equipment

Record data as described in MTP 2-3-512 (ref 4.AA).

6.3.27

Security (Susceptibility to Detection)

Record data as described in MTP 2-3-511 (ref 4.AB).

6.3.28

Fording

Record data as described in MTP 2-3-509 (ref 4.AC).

6.3.29

Target Designation and Screening

6.3.29.1 Phase I - Target Designation

a. Record the following for crew/weapon system firing marker (MP) round:

- 1) Date and time
- 2) Nomenclature and serial number of:

- a) Weapon being used.
- b) Vehicle on which weapon was mounted.
- c) Sight used.

- 3) Gunner's name, rank or grade.
- 4) Nomenclature and lot number of marker (smoke) round.
- 5) Number of miles marker round had been transported in on-vehicle ammunition racks, when applicable.

- 6) Method used for determining range to target.
- 7) Range to target as determined.
- 8) Surveyed range to target.
- 9) Direction of wind as related to the gun target line.
- 10) Wind velocity.
- 11) Strike of marker round in relation to target.

b. Record data as described in paragraph a.1) through 3) and the following for the adjacent (supporting) vehicles:

- 1) Nomenclature and lot number of ammunition fired.
- 2) Whether the designated target was recognized.
- 3) Number of participating vehicles.
- 4) Number of hits obtained with:
 - a) First round.
 - b) Second round.
 - c) Third round.

5) Number of vehicles, if any, which failed to hit the target.

- 6) Total number of rounds fired.
- 7) Total number of target hits.

c. Retain all photographs.

6.3.29.2 Phase II - Target Screening

Record data as described in paragraph 6.3.29.1a) through 10) above and the following:

a. Number and type of cameras used and their position in relation to the firing vehicle(s).

b. Number of observers and:

- 1) Type optical equipment used, if any.
- 2) Their position in relation to the firing vehicle(s).

c. Description of the target formation including breadth and depth.

d. Number of rounds and time required to completely screen the target formation.

e. Number of additional rounds required, if any, to maintain the screen for:

- 1) Three minutes.
- 2) Five minutes.

3) Ten minutes.

i. Retain the following:

- 1) All film and/or negatives.
- 2) The narrative description of the effectiveness of the screening operation prepared by each observer to include:
 - a) His position in relation to the firing vehicle(s).
 - b) Typical optical instruments used, if any.

6.3.30 Tracking and Hitting Performance, Stationary Gun Mount-Moving Target

Record data as described in MTP 3-3-507 (ref 4.AE).

6.3.31 Tracking and Hitting Performance, Moving Gun Mount-Stationary Target

Record data as described in MTP 3-3-508 (ref 4.AF).

6.3.32 Tracking and Hitting Performance, Moving Gun Mount-Moving Target

Record data as described in MTP 3-3-509 (ref 4.AG).

6.3.33 Grenade Launcher Performance

6.3.33.1 Phase I - Screening Effectiveness

6.3.33.1.1 Preparation for Test. Retain the scaled plot of the test site showing:

- a. Camera positions.
- b. Observers' positions and whether optical instruments were used.

c. Position of reference flags

d. Type and location of meteorological equipment.

6.3.33.1.2 Method. Record or retain the following:

- a. For firing all dispensers, one at a time in rapid succession:
 - 1) Date and time.
 - 2) Nomenclature and serial number, when applicable, of:
 - a) Grenade launcher(s).
 - b) Grenades for launcher.

c. Vehicle on which launcher is mounted.

- 3) Number of dispensers in the system.
- 4) Arrangement of dispensers.
- 5) Time required to fire all dispensers on a one-at-a-time basis.
- 6) Distance from vehicle that grenades impacted.
- 7) Lateral measurement of smokescreen.
- 8) Whether the smoke screened the vehicle and duration of screen.
- 9) All film and/or photographs.
- 10) Each observer's narrative description of the screen and his opinion of its effectiveness.
- 11) Graph showing dimensions of the screen.
- 12) Number of:

- a) Grenades fired down dispensers previously, when applicable.
- b) Number of test miles grenades had been transported cross-country in the on-vehicle stowage racks and/or in the grenade launchers, when applicable.
- 13) Ambient temperature.
- 14) Relative humidity.
- 15) Wind speed and direction.
- 16) All misfires with causes, when possible, and data in 12) above.

b. Applicable data described in paragraph a above when dispensers are fired in the following modes as may be applicable:

- 1) Two-round salvos
- 2) Four-round salvos
- 3) All fired simultaneously.
- 4) Fired in any other combination, if applicable

c. Applicable data described in paragraph a above and mode of firing and number of rounds required to completely mask the vehicle across a 120 degree front for:

- 1) Three minutes.
- 2) Five minutes.
- 3) Eight minutes.
- 4) Ten minutes.

d. Applicable data described in paragraph a above and mode of firing and number of rounds required to completely mask the vehicle across a 180 degree front for:

- 1) Three minutes.

- 2) Five minutes.
- 3) Eight minutes.
- 4) Ten minutes.

6.3.33.2 Phase II - Antipersonnel Effectiveness

6.3.33.2.1 Preparation for Test. Retain or record:

- a. The scaled plot of the target arrangement.
- b. Type and number of targets used.
- c. Diagram of dispenser arrangement.

6.3.33.2.2 Method. Record or retain the following:

- a. For each dispenser when fired one at a time:
 - 1) Total number of targets hit.
 - 2) Number of hits on each target by target number.
 - 3) The minimum and maximum distances from the vehicle at which hits were obtained.
- b. For all rounds fired by salvos:
 - 1) Size of salvo and location and number of each dispenser.
 - 2) Total number of targets hit.
 - 3) Number of hits on each target by target number.
 - 4) Number of rounds required to cover:
 - a) A 120 degree area centered on the front of the vehicle.
 - b) A 180 degree area centered on the front of the vehicle.
 - c) A complete circle around the vehicle.

c. The miles rounds had been transported in the on-vehicle ammunition racks, when applicable.

d. Differences, if any, in results obtained with:

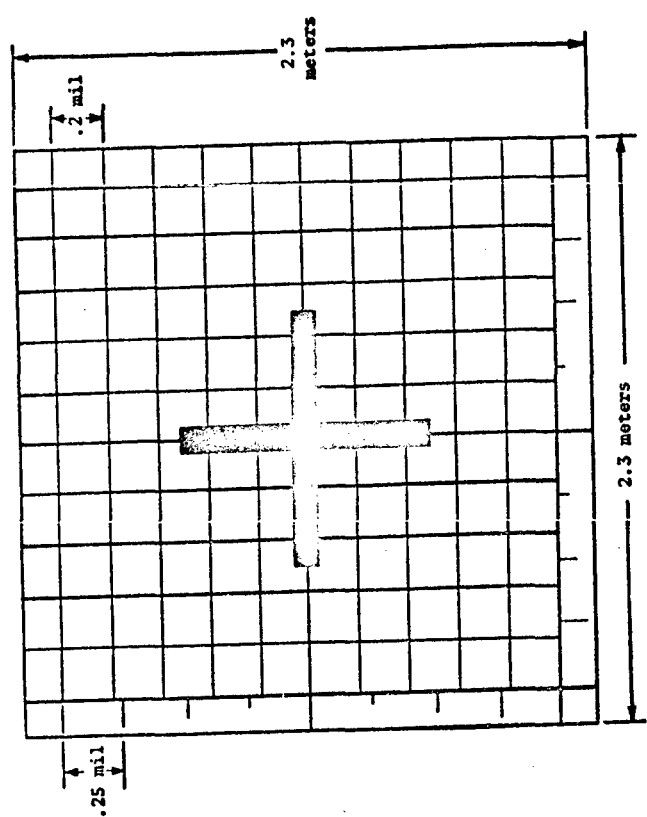
- 1) Rounds transported in on-vehicle ammunition racks.
- 2) Rounds not transported in on-vehicle ammunition racks.

6.3.34. Simulated Tactical Operation

Record data as described in MTP 2-3-506 (ref 4.AH).

6.3.35 Transportability

APPENDIX A
Target for Measuring Gun/Turret Throw-Off



NOTE: For use at 1,000 meters

Explanatory Notes:

Pattern for preparation of a target cloth panel of dimensions shown; to be centered on 6.1-m X 6.1-m cloth or wire mesh backing.

Aiming cross has 1-meter members.

- a. Surface Transportability (Vehicles). Record data as described in MTP 2-3-519 (ref 4.AI).
- b. Air Portability, Internal - Suitability of Supplies and Equipment for. Record data as described in MTP 7-3-515 (ref 4.AJ).
- c. Air Portability, External - Suitability of Supplies and Equipment for. Record data as described in MTP 7-3-516 (ref 4.AK).
- 6.3.36 Logistics Over-the-Shore (LOTS)
Record data as described in MTP 2-3-520 (ref 4.AL).
- 6.3.37 Maintenance Evaluation
 - a. Maintainability. Record data as described in MTP 2-3-502 (ref 4.AM).
 - b. Tools and Test Equipment. Record data as described in MTP 2-3-527 (ref 4.AN).
 - c. Technical Manuscripts and Manuals. Record data as described in MTP 2-3-528 (ref 4.AO).
- 6.3.38 Reliability
Record data as described in MTP 2-3-507 (ref 4.AP).
- 6.4 DATA REDUCTION AND PRESENTATION
 - a. All data obtained by inspection, observation, questionnaires and testing, including photographs, shall be analyzed and presented in a manner to indicate whether the test item meets the established criteria.
 - b. A Safety Confirmation shall be presented in accordance with USATECOM REG 385-6.

UNCLASSIFIED

MTP 3-3-090

Security Classification		DOCUMENT CONTROL DATA - R & D	
(Security classification of title, body of abstract and indexing annotation must be entered when the owner of report is classified)			
1. ORIGINATING ACTIVITY (Corporate author)		2a. REPORT SECURITY CLASSIFICATION	
U.S. Army Test & Evaluation Command Aberdeen Proving Ground, Maryland 21005		UNCLASSIFIED	
3. REPORT TITLE		2b. GROUP	
U.S. Army Test and Evaluation Command Commodity Service Test Procedure "Tank, Combat, Full Tracked"		-----	
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)			
Final			
5. AUTHOR(S) (First name, middle initial, last name)			

6. REPORT DATE		7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
28 January 1971		45	42
8a. CONTRACT OR GRANT NO.		8b. ORIGINATOR'S REPORT NUMBER(S)	
		MTP (3-3-090)	
9. PROJECT NO.		10. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
AMCR 310-6		-----	
11. DISTRIBUTION STATEMENT			
Approval for public release; distribution unlimited.			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY	
-----		Headquarters U.S. Army Test and Evaluation Command Aberdeen Proving Ground, Maryland 2100-	
13. ABSTRACT			
Procedures are described for evaluating combat tanks under simulated tactical conditions. Weapon effectiveness, and communication devices are included.			

DD FORM 473, 1 NOV 66

UNCLASSIFIED

Security Classification

UNCLASSIFIED
Security Classification

14.	Security Classification	KEY WORDS	LINK A		LINK B		LINK C	
			ROLE	WT	ROLE	WT	ROLE	WT
		Tank, combat Tank, armament Tank, communications						

UNCLASSIFIED
Security Classification